MULTIMEDIA UNIVERSITY

STUDENT IDENTIFICATION NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 2, 2015/2016

BDS 4614 – MANAGEMENT DECISION SCIENCE

(All sections / Groups)

11 March, 2016

9am – 12pm
(3 Hours)

INSTRUCTIONS TO STUDENTS

1. This Question paper consists of **FIVE** pages with **FIVE** Questions only.

2. Answer **ALL** the questions. All questions carry equal marks and the distribution of the marks for each question is given .

3. Please write all your answers in the Answer Booklet provided.

QUESTION 1

George Hoke owns Hoke's Spokes, a bicycle shop. Most of George's bicycle sales are customer orders; however, he also stocks bicycles for walk-in customers. He stocks three types of bicycles, - road racing, cross-country and mountain. A road-racing bike costs $1200, a cross country bike costs $1700 and a mountain bike costs $900. He sells road-racing bikes for $1800, cross-country bikes for $2100 and mountain bikes for $1200. He has $12000 available this month to purchase bikes. Each bike must be assembled - a road-racing bike requires 8 hours to assemble, a cross-country bike requires 12 hours and a mountain bike requires 16 hours. He estimates that he and his employees have 120 hours available to assemble bikes. He has enough space in his store to order 20 bikes this month. Based on past sales, George wants to stock at least twice as many mountain bikes as the other two combined because mountain bikes sell better.

a) Formulate the given problem as a Linear Programming Problem.

[4 marks]

b) Set up the initial simplex tableau by including the necessary slack variables.

[4 marks]

c) Determine the second simplex tableau by using simplex method.

[6 marks]

Given the following **Final Tableau**

C_j →		0.1	0.08	0.06	0	0	0		
↓	Solution Mix	X_1	X_2	X_3	S_1	S_2	S_3	S_4	Quantity
0	S_1	0	200	0	1	-75	0	-300	3000
1200	X_3	0	0.2	1	0	0.05	0	-0.2	6
0	S_3	0	-0.3	0	0	-0.075	1	-0.2	11
1800	X_1	1	1.1	0	0	0.025	0	0.4	3
	Z_j	1800	2220	1200	0	105	0	480	12600
	$C_j - Z_j$	0	-120	0	0	-105	0	-480	

S_1 – slack for total budget constraint
S_2 – slack for assembling hours constraint
S_3 – slack for storage constraint
S_4 – slack for mountain bike constraint

d) Determine the optimal sales plan and maximum revenue.

[3 marks]

e) Determine the dual price of total budget and discuss the effect of increasing the total budget on total revenue.

[3 marks]

[Total: 20 Marks]

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QUESTION 2

a) Henry Enterprises manufactures the Central Processing Unit (CPU) for a line of personal computers. The CPUs are manufactured in three plants at different locations and shipped to warehouses situated at 3 different areas. The following transportation tableau shows the number of CPUs' available at each plant and the number of CPUs' required by each warehouse. The shipping cost (RM per unit) is given in each cell in the table below.

Plant	Warehouse			CPUs Available
	Warehouse 1	Warehouse 2	Warehouse 3	
Plant 1	10	20	5	900
Plant 2	6	10	8	400
Plant 3	3	12	7	800
CPUs required	600	800	700	

Determine the initial solution, using the Northwest Corner method, and then obtain the optimal production plan, by using the Stepping Stone method. What is the minimum cost?

[10 marks]

b) A shop has four machinists to be assigned to four machines. The cost (RM per hour) of having each machine operated by each machinist is given in the table below:

Machinist	Machine			
	A	B	C	D
1	12	11	8	14
2	10	9	10	8
3	14	8	7	11
4	6	8	10	9

Determine the optimal assignment and compute the total minimum cost. **[10 marks]**

[Total: 20 Marks]

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QUESTION 3

Eco-City Development has undertaken a civil project that involves eleven main activities as given below. The project management team has identified the immediate predecessor activity/activities and has assessed the completion of each activity under optimistic, most likely, and pessimistic time estimates. The details are given in the table below:

Activity	Immediate Activity	Completion Time (weeks)		
		Optimistic	Most Likely	Pessimistic
A	-	8	13	18
B	-	6	8	10
C	A	2	4	6
D	B	8	11	14
E	C	7	10	13
F	E	4	6	8
G	C	4	12	20
H	D, F, G	4	6	8
I	E	6	9	12
J	H	3	4	5
K	I, J	2	4	6

REQUIRED:

a) Calculate the mean and the variance completion time (in weeks) for each activity. **[6 marks]**

b) Draw a network diagram to represent the project based on the expected or mean duration time. **[6 marks]**

c) What is the expected completion time for the project and the associated critical path? **[5 marks]**

d) Calculate the project variance. **[3 marks]**

[Total: 20 marks]

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QUESTION 4

Alfred Fleming is the purchasing agent for Spectre Valve Company. Spectre Valve sells industrial valves and fluid control devices. One of the most popular valves is the Mi6, which has an annual demand of 4,000 units. The cost of each Mi6 valve is $90, and the inventory carrying cost is estimated to be 10% of the cost of each valve. Alfred has made a study of the costs involved in placing an order for Mi6 valves that Spectre Valve stocks, and he has concluded that the average ordering cost is $25 per order. Furthermore, it takes about two weeks for an order to arrive from the supplier, and during this time the demand per week is approximately 80.

a) What is the Economic Order Quantity? **[5 marks]**
b) What is the Re-Order Point? **[3 marks]**
c) What is the average inventory? What is the annual holding cost? **[4 marks]**
d) How many orders per year would be placed? What is the annual ordering cost? **[4 marks]**
e) What is the total annual inventory cost? **[4 marks]**

[Total 20 Marks]

QUESTION 5

An industrialist intends to start his own design business. His problem is to decide how large his business should be. The annual profit will depend on the market conditions and the size of his business. He has constructed the following payoff table to analyse his situation and he speculates that the probabilities of a good market, a fair market and a poor market are 0.5, 0.3 and 0.2 respectively.

Size of Business	**Good Market (RM)**	**Fair Market (RM)**	**Poor Market (RM)**
Small	70000	20000	-30000
Medium	90000	20000	-50000
Large	290000	15000	-170000
Probability	0.3	0.4	0.3

Based on the above estimates, if the industrialist were to construct a small office and if the market condition is good, he will realize a profit of RM70,000.

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Determine the best decision, using the following decision criteria:

a) Maximax **[2 marks]**
b) Maximin **[2 marks]**
c) Hurwicz criterion of realism ($\alpha = 0.8$) **[3 marks]**
d) Equally Likely **[2 marks]**
e) Minimax regret **[4 marks]**
f) Expected Monetary Value **[3 marks]**

g) Calculate how much the firm would be willing to pay to a market research firm to gain better information about future market conditions. **[4 marks]**

[Total 20 marks]

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